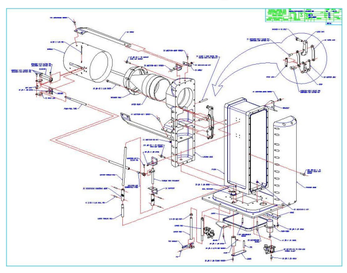
Curating Digital Engineering Documents

KNOWLEDGE & INFORMATION MANAGEMENT THROUGH LIFE

The Context

Up until the turn of the millennium, Engineering software was used to support a paper-based workflow. Computer-aided design (CAD) packages were used to create virtual models of designs, from which drawings and other design documentation could be produced. The manufacture or construction process was based on this documentation.



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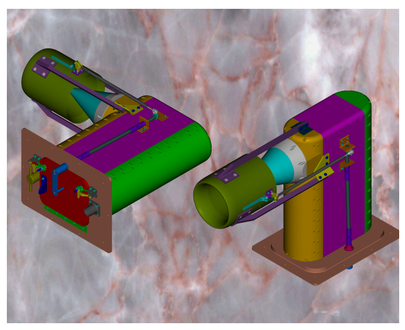
Within the last five years or so, the industry has moved over to using the CAD models directly for communicating designs, not only to manufacturers and builders, but also to regulating authorities and maintenance crews. At the same time, the companies that design and build the products are increasingly entering into contracts to provide through-life support for them. For products such as cruise ships, military aircraft, hospitals and schools, this could mean contracts lasting thirty years, seventy years or even longer.



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The Problem

Cadsoft, GRAPHISOFT Virtual Building Solutions, IronCAD LLC, KeyCreator, Alibre, DASSAULT SYSTEMES, UGS Transforming the process of innovation, VariCAD, Autodesk, BENTLEY, PTC, TopSolid

The CAD software market is competitive, and characterised by a wide selection of rapidly developing tools, few of which have interoperability as a high priority. Indeed, many CAD tools do not even have reliable compatibility with their own previous versions.

Such is the speed of development that in some cases, the software used to create a design can be obsolete and the source code forgotten even before the product has ceased manufacture. While previous designs were preserved on paper, today's designs will not be available for when manufacturing processes need to be reworked, or when spare part stocks need to be replenished. It also drives up the cost of new designs if old designs cannot be reused and adapted.

Problems with established solutions

The problem with emulating old software is the challenge of integrating it into more modern workflows. There may not only be problems with getting old CAD software to talk to newer numerical control part programs, but there may not be any designers left who can use the old software.

The problem with migrating old designs to newer formats is that, given the lack of correspondence between CAD formats, and between different versions of the same CAD format, there is always the risk of data loss and subtle design corruption. The cost of re-checking and re-validating a design after migration can be prohibitive.

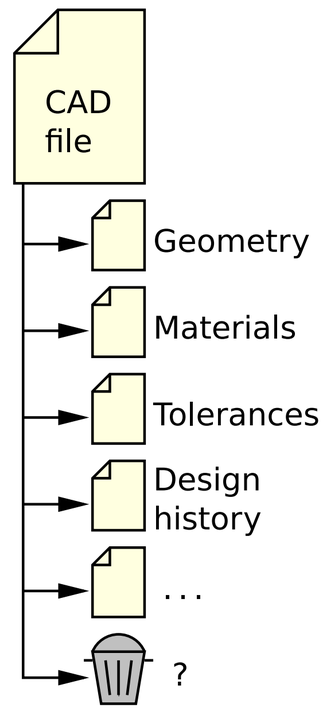
The problem with devising a comprehensive exchange standard for CAD models is that, due to the rigours of the standards process, it cannot hope to stay up to date with the latest capabilities of CAD tools. Furthermore, the level of support for such standards can vary between tools.

This work is supported by the UK Engineering and Physical Sciences Research Council (EPSRC) and the Economic and Social Research Council (ESRC) under Grant Numbers EP/C534220/1 and RES-331-27-0006.

Proposed solution

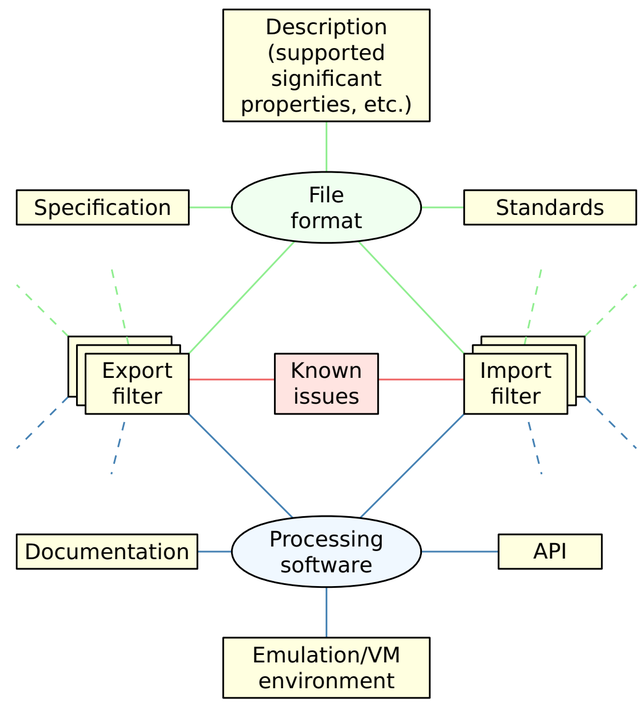
The KIM Project is a collaboration of eleven UK universities with funding from the EPSRC and ESRC, set up to tackle the grand challenge presented by the Engineering industry shifting its focus from product delivery to product-service.

The solution we propose is based on the idea of lightweight representations: simple formats that are easy to preserve but which do not try to retain all the richness of the full CAD model. By producing files in these formats at the time of the original design, they can be validated at the same time as the full model. Their simplicity makes them easier to read back into newer software. The problem is making sure no information is lost that will be important for future reference and re-use.



Choosing the right format

UKOLN and the University of Bath are co-operating with the Digital Curation Centre to produce a representation information registry for Engineering file formats, particularly CAD file formats and corresponding lightweight representations. This registry will identify the capabilities of various file formats to handle key aspects of model data, and collect together the experiences companies have had migrating between different file formats. In this way we hope to assemble a network of representation information that will enable people to choose the optimum formats for long-term preservation, and the optimum way of converting their data to that format.



Research tasks

1. Identify Knowledge Base. What information within industry can we 'take for granted'?
2. Identify target formats. Which are the most common file formats used by UK industry?
3. Develop use cases. How will the registry be used? What information will the registry need to hold to support this use?
4. Gather Representation Information for inclusion in the registry.
5. Initial proof of concept. The theory of the approach will be tested with simple formats initially.
6. Integrate Representation Information into the DCC Representation Information Registry/Repository (RI RegRep).
7. Produce demonstrator that uses the DCC RI RegRep to generate optimum migration pathways and suggest appropriate destination formats.

Further Information

KIM Project.....⟨http://www.kimproject.org/⟩
Digital Curation Centre.....⟨http://www.dcc.ac.uk/⟩

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21–22 November 2006